

**INDIANA DEPARTMENT OF TRANSPORTATION  
OFFICE OF MATERIALS MANAGEMENT**

**TEST SECTIONS FOR AGGREGATES AND RECYCLED MATERIALS  
ITM No. 514-15T**

**1.0 SCOPE.**

- 1.1** This test method describes a procedure by a test section using a Light Weight Deflectometer (LWD) to determine the maximum allowable deflection of aggregate, or using a Dynamic Cone Penetrometer (DCP) to determine the roller type, pattern, and number of passes of the roller for recycled materials.
- 1.2** The fundamental requirement for valid test section results is the proper application of a standard compactive effort by using specified rollers. The application of this specific compactive effort requires repeated roller applications until no further appreciable increase in stiffness is obtained. At this point, the stiffness is presumed to have reached a maximum value and is considered to have peaked.
- 1.3** Test sections shall be constructed in the presence of a representative of the Department with the available equipment of the Contractor.
- 1.4** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

**2.0 REFERENCES.**

**2.1 AASHTO Standards.**

- T 88 Particle Size Analysis of Soils
- T 89 Determining the Liquid Limit of Soils
- T 90 Determining the Plastic limit and Plasticity Index of Soils
- T 99 Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12 in.) Drop
- T 255 Total Evaporative Moisture Content of Aggregates by Drying

- 3.0 TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specification, Section 101.

**4.0 SIGNIFICANCE AND USE.** This ITM shall be used to obtain the maximum allowable deflection of aggregates, or determine the roller type, pattern, and number of passes to obtain the laboratory determined target DCP value for recycled materials. Recycled materials shall include foundry sand, coal ash, or other recycled materials for similar use as determined by the Department.

**5.0 APPARATUS.**

- 5.1** Force-Generating Device, 10 kg  $\pm$  0.1kg falling weight with a guide system, lock pin and spring assembly. The mass of the guide rod is 5 kg  $\pm$  0.25 kg and the maximum impact force is 7.07 kN. The fixed drop height shall be in accordance with the manufacturer recommendation.
- 5.2** Loading Plate, made of steel, having dimensions of 300 mm in diameter and 20 mm in thickness. The plate shall have two handles and weigh 15 kg  $\pm$  0.25 kg.
- 5.3** Deflection Sensor, capable of measuring the maximum vertical movement with an accelerometer. The accelerometer is required to be attached to the center of the plate.
- 5.4** Data Processing and Storage System, capable of displaying and recording the loading data, deflection data, and the test location for each test
- 5.5** Dynamic Cone Penetrometer, with a 17.6 lbm steel drop hammer located between the handle and coupler assembly on a 0.625 in. diameter steel rod. The steel rod is required to be a minimum of 24 in. in length and be threaded on both ends to allow the attachment of a cone on one end and an anvil on the other end. The distance from the bottom of the hammer to the coupler assembly is 22.6 in. On the bottom of the rod is a replaceable hard sharp conical tip with an included angle of 60° and a diameter at the base of 0.79 in. The rod shall have 0.5 in. graduations. A ruler may be used to indicate the required penetration of the DCP on the steel rod.
- 5.6** Miscellaneous equipment such as a spade, broom, and trowel

**6.0 ROLLER EQUIPMENT**

- 6.1** The roller used for the test section for aggregates shall be a vibratory roller in accordance with 409.03(d)4 or 409.03(d)5.
- 6.2** The roller used for the test section for recycled materials shall be a tandem roller in accordance with 409.03 (d)1 or other approved compacting equipment capable of providing a smooth and even surface.

- 6.3** The vibratory roller shall be operated in the vibratory mode and at speeds not to exceed 2.5 mph.

## **7.0 TEST SECTIONS**

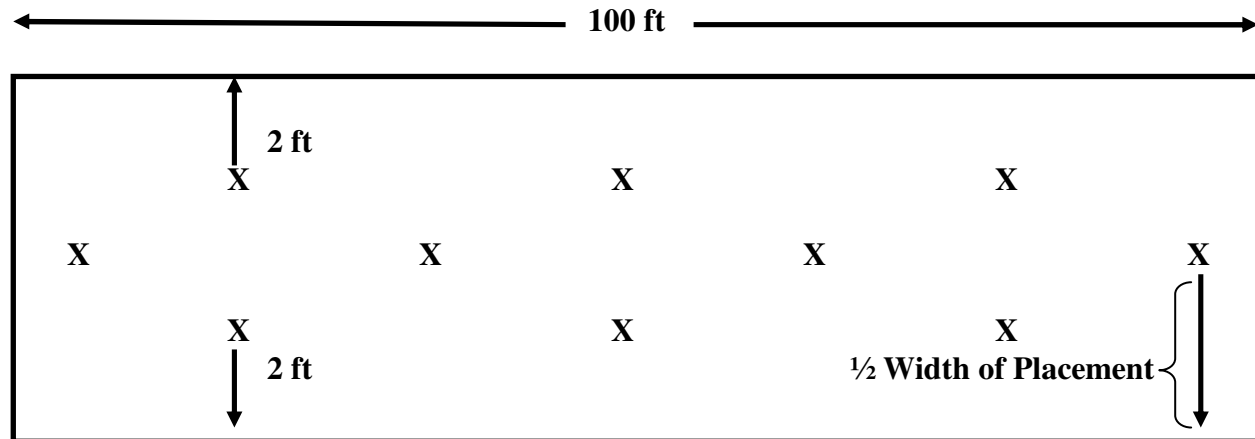
- 7.1** The test section shall be an area approximately 100 ft long by 20 ft wide. The depth shall be the lift thickness for aggregates, and 1 ft for recycled materials. Areas not meeting these minimum criteria will be considered.
- 7.2** The subgrade shall be proofrolled in accordance with 203.26 prior to construction of the test section.
- 7.3** One moisture test shall be performed in accordance with AASHTO T 255 for aggregates and AASHTO T 99 for recycled materials prior to compaction of the test section. The moisture content shall be within -3 percentage points of optimum moisture content and the optimum moisture content.
- 7.4** The number of required blow counts for a 6 in. lift shall be determined for recycled materials prior to compaction of the test section by performing the sieve analysis, liquid limit, plastic limit, and optimum moisture and maximum density in accordance with AASHTO T 88, T 89, T 90, and T 99 respectively on representative samples of the recycled materials.

## **8.0 PROCEDURE - AGGREGATES**

- 8.1** Mark the test section as described in 7.1.
- 8.2** Compact the test section with a roller operated in the vibratory mode and initially compact the test section with 4 roller applications (Note 1). There shall be no stopping or turning within the test section.

Note 1: A roller application is defined as one pass of the roller over the entire test section.

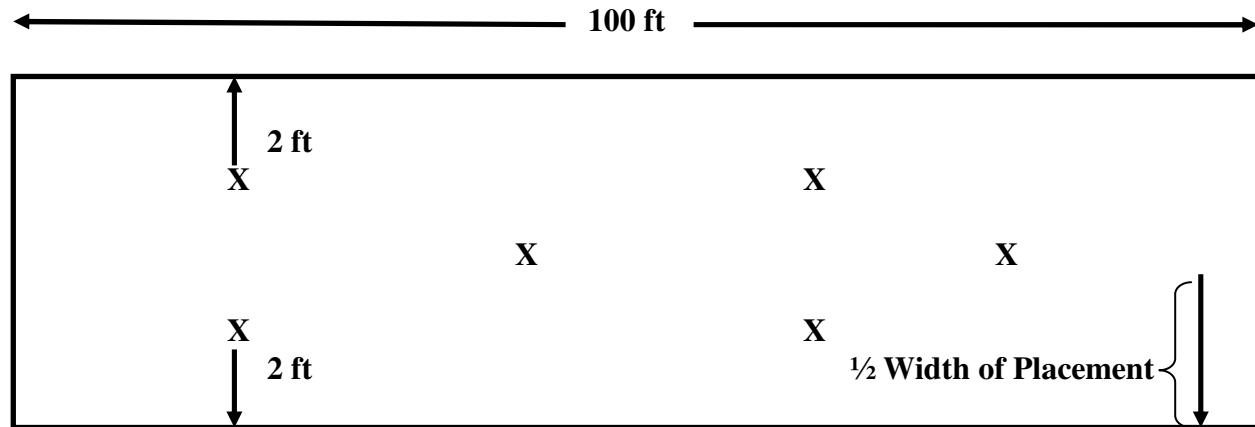
- 8.3** Obtain 10 LWD tests on the test section at the following approximate locations and mark the locations of the 10 LWD tests. Average the 10 LWD test results.



- 8.4** Compact the test section with one additional roller application in the vibratory mode, obtain 10 LWD tests at the same locations, and average the 10 LWD test results.
- 8.5** If the difference between the average LWD test values obtained from 4 and 5 roller applications is equal to or less than 0.02 mm, the compaction will be considered to have peaked and the test section procedure is finished.
- 8.6** If the difference between the average LWD test values obtained from 4 and 5 roller applications is greater than 0.02 mm, an additional roller application in the vibratory mode shall be made. Ten LWD tests shall be obtained at the same locations and the 10 LWD test results shall be averaged. This procedure shall continue until the difference of the average of the 10 LWD tests between consecutive roller applications is equal to or less than 0.02 mm.
- 8.7** The maximum allowable deflection shall be the lowest average of the 10 LWD test values.

## **9.0 PROCEDURE – RECYCLED MATERIALS**

- 9.1** Place the recycled material in two 6 in. successive lifts in accordance with 203.23.
- 9.2** Mark the test section as described in 7.1.
- 9.3** Compact the test section with the required roller with 4 roller applications (Note 1). There shall be no stopping or turning within the test section.
- 9.4** Obtain 6 DCP tests on the test section at the following approximate locations and mark the locations of the 6 DCP tests.



- 9.5** Blow counts greater than 10 or less than 6 for the lift will be discarded and a new random test location will be selected in the test section so that 6 DCP tests shall be obtained. The 6 DCP test results shall be averaged.
- 9.6** If the average DCP blow count for a 6 in. lift is equal to or greater than the laboratory determined target DCP value, the test section is considered to have peaked and the test section procedure is completed.
- 9.7** If the average DCP blow counts for a 6 in. lift is less than the laboratory determined DCP target value, an additional roller application shall be made. Six DCP tests shall be obtained at 1 ft from the same locations as the original 6 DCP tests and the 6 DCP test results shall be averaged. This procedure shall continue until the average of the 6 DCP blow counts is equal to or greater than the laboratory determined target DCP value for a 6 in. lift.
- 9.8** The roller type, pattern, and the number of passes to obtain the laboratory determined target DCP value shall be obtained.

## **10.0 REPORT.**

- 10.1** The maximum allowable deflection shall be reported to the nearest second decimal place (0.00).
- 10.2** The roller type, pattern, and number of passes to obtain the laboratory determined target DCP value for a 6 in. lift shall be reported.